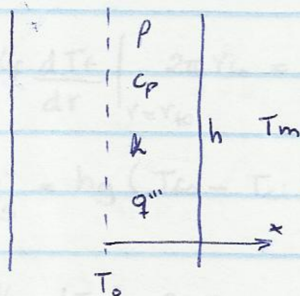
$$q' = 2\pi r_g q''_g = 2\pi r_g h_g (T_{fo} - T_{ci})$$

$$q''_g = h_g (T_{fo} - T_{ci})$$

$$T_f(r) = -\frac{q''' r^2}{4 k_f} + \frac{q'}{4\pi k_f} + \frac{q'}{2\pi r_g h_g} + \frac{q'}{2\pi k_c} \ln \frac{r_{co}}{r_{ci}} + \frac{q'}{2\pi r_{co} h} + T_m$$

Caso (10) 05/12/2012



Uma placa plana com propriedades ρ, c_p, k e Temperatura inicial uniforme T_o está subitamente submersa num fluido com Temperatura T_m, Tendo o coeficiente de Transferência de calor convectivo h com o fluido, e a Taxa volumétrica uniforme de geração de calor q'''.

$$\rho c_p \frac{\partial T}{\partial t} = k \frac{\partial^2 T}{\partial x^2} + q'''$$

$$\frac{\partial T}{\partial x} = 0 \quad \text{em} \quad x = 0$$

$$-k \frac{\partial T}{\partial x} = h(T - T_m) \quad \text{em} \quad x = a$$

$$T(x,0) = T_o \quad \text{em} \quad t = 0$$

Adimensionalização do modelo matemático

$$\theta = \frac{T - T_m}{T_o - T_m} \Rightarrow T = T_m + \theta (T_o - T_m)$$

$$\eta = \frac{x}{a} \Rightarrow x = \eta . a$$

$$\alpha = \frac{k}{\rho c_p}$$ ⇒ difusividade Térmica

$$\rho c_p \frac{\partial \theta}{\partial t} (T_o - T_m) = \frac{k (T_o - T_m)}{a^2} \frac{\partial^2 \theta}{\partial \eta^2} + \frac{q'''}{T_o - T_m}$$

credeal